

## The Claims

What is claimed is:

1. A bone fixation assembly comprising:
  - 5 a bone fastener comprising a head, a shank, and a collar, the collar having a top portion and a plurality of lower portions, at least two adjacent lower portions forming at least one edge; and
    - a receiving member comprising at least one bore that defines an inner surface,
  - 10 wherein the collar and inner surface contact one another along the at least one edge.
2. The bone fixation assembly of claim 1, wherein the at least one edge generally defines a ring.
  - 15 3. The bone fixation assembly of claim 1, wherein the at least one edge comprises two edges which each generally define a ring, the rings being concentric.
  4. The bone fixation assembly of claim 1, wherein each edge generally defines a ring.
    - 20 5. The bone fixation assembly of claim 4, wherein the at least one edge defines a plurality of concentric rings.
  - 25 6. The bone fixation assembly of claim 1, wherein the fastener is disposed about a longitudinal axis and the at least one bore is disposed about a central axis, the fastener being positionable so that the longitudinal axis is transverse to the central axis when the collar of the fastener abuts the inner surface of the bore.
  - 30 7. The bone fixation assembly of claim 1, wherein the at least one bore has first and second portions, the first portion having a substantially constant diameter and the second portion having a plurality of different diameters.
  - 35 8. The bone fixation assembly of claim 7, wherein the second portion is concave.

9. The bone fixation assembly of claim 8, wherein the concave portion has a radius of curvature and the ratio of half the diameter of the first portion to the radius of curvature is between about 0.5 and about 1.0.

5 10. The bone fixation assembly of claim 9, wherein the ratio of half the diameter of the first portion to the radius of curvature is between about 0.85 and about 0.95.

11. The bone fixation assembly of claim 1, wherein the fastener has a longitudinal axis and the collar has a generally circular cross-section transverse to the  
10 longitudinal axis.

12. The bone fixation assembly of claim 11, wherein the collar has a substantially constant diameter.

15 13. The bone fixation assembly of claim 12, wherein the collar diameter is between about 4 mm and about 10 mm.

14. The bone fixation assembly of claim 12, wherein the collar has a thickness defined between the top portion and a lowest of the lower portions between about  
20 0.5 mm and about 2 mm.

15. The bone fixation assembly of claim 1, wherein the fastener head is convex with respect to the shank.

25 16. The bone fixation assembly of claim 15, wherein at least a portion of the fastener head is substantially semispherical.

17. The bone fixation assembly of claim 1, wherein the fastener head is integrally formed with the shank.  
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18. The bone fixation assembly of claim 1, wherein the fastener head is removably attached to the shank.

19. The bone fixation assembly of claim 1, further comprising a clamping member, wherein the clamping member is capable of locking the bone fastener with respect to the receiving member in a fixed configuration.

5 20. The bone fixation assembly of claim 19, wherein the clamping member is a grub screw.

10 21. The bone fixation assembly of claim 19, wherein the clamping member is releasably associated with the receiving member for releasably locking the assembly in a fixed configuration.

22. The bone fixation assembly of claim 19, wherein the clamping member is threadably associated with the receiving member.

15 23. The bone fixation assembly of claim 1, wherein the inner surface comprises a deformable material such that a form-fit connection is obtainable between the collar and receiving member.

20 24. The bone fixation assembly of claim 1, wherein the receiving member further comprises a channel extending transverse to a central axis of the bore, the channel configured and dimensioned to receive a longitudinal support.

25 25. The bone fixation assembly of claim 24, further comprising a longitudinal support.

26. A device for osteosynthetic bone fixation comprising:  
a bone fastener comprising a collar and a shank, the collar having a top portion and a plurality of lower portions, at least two adjacent lower portions forming at least one edge; and  
30 a receiving member comprising at least one bore that defines an inner surface with a first cylindrical portion and a second non-cylindrical portion,  
wherein the at least one edge abuts the non-cylindrical portion at a selectable angle.

27. The device of claim 26, wherein the bone fastener has a longitudinal axis and the collar is disposed generally concentric to the longitudinal axis.

28. The device of claim 27, wherein the at least one edge is disposed  
5 generally concentric to the longitudinal axis.

29. The device of claim 28, wherein the at least one edge is substantially circular with each of the at least one edge being disposed along an imaginary convex surface.

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30. The device of claim 29, wherein the imaginary convex surface is spherical.

31. The device of claim 27, wherein the collar has a substantially  
15 constant diameter.

32. The device of claim 31, wherein the diameter is between about 4 mm and about 10 mm.

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33. The device of claim 27, wherein the collar has a thickness defined between the top portion and a lowest of the lower portions between about 0.5 mm and about 2 mm.

34. The device of claim 27, wherein the bone fastener further comprises a  
25 head that is convex with respect to the shank.

35. The device of claim 34, wherein at least a portion of the head is substantially semispherical.

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36. The device of claim 34, wherein the head is integrally formed with the shank.

37. The device of claim 34, wherein the fastener head is removably attached to the shank.

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38. The device of claim 26, further comprising a clamping member, wherein the collar is releasably lockable by the clamping member.

39. The device of claim 38, wherein the clamping member is a grub  
5 screw.

40. The device of claim 38, wherein the clamping member is a nut.

41. The device of claim 27, wherein the receiving member further  
10 comprises a channel extending transverse to a central axis of the bore, the channel  
configured and dimensioned to receive a longitudinal support.

42. The device of claim 41, further comprising a longitudinal support.

15 43. A bone screw comprising:  
a head;  
a shank; and  
a collar disposed between the head and shank and comprising a top portion  
and a plurality of lower portions, at least two adjacent lower portions forming at least one  
20 edge generally concentric to a longitudinal axis of the bone screw,  
wherein each edge is disposed along an imaginary convex surface that is  
generally spherical.

44. The bone screw of claim 43, wherein the collar has two edges.  
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45. The bone screw of claim 43, wherein each edge has a diameter, and  
the diameters of the edges decrease as a function of increasing distance from the head.

30 46. The bone screw of claim 45, wherein the collar is disk-shaped.  
47. The bone screw of claim 43, wherein the head is convex with respect  
to the shank.

35 48. The bone screw of claim 44, wherein at least a portion of the head is  
substantially semispherical.

49. The bone screw of claim 48, wherein the head is integrally formed with the shank.

50. The bone screw of claim 48, wherein the head and shank are  
5 separately formed.

51. The bone screw of claim 50, wherein the head is releasably associated with the shank.

10 52. The bone screw of claim 50, wherein the head is threadably associated with the shank.

53. The bone screw of claim 50, wherein the head is connected to the shank by a conical peg that is received in a conical bore, with the conical peg and conical  
15 bore being disposed along the longitudinal axis.

54. The bone screw of claim 50, wherein the head is connected to the shank by a bayonet lock.

20 55. The bone screw of claim 48, wherein the head further comprises a zenith disposed on the longitudinal axis.

56. The bone screw of claim 43, wherein each edge forms a generally circular shape having a diameter between about 4 mm and about 10 mm.

25 57. The bone screw of claim 43, wherein each edge forms a generally circular shape having a diameter between about 8 mm and about 10 mm.

58. The bone screw of claim 43, wherein the collar has a thickness  
30 defined between a top surface and a bottom surface between about 0.5 mm and about 2 mm.

59. The bone screw of claim 43, wherein the shank has an external diameter between about 3 mm and about 6 mm.

60. The bone screw of claim 43, wherein each edge forms a substantially circular shape.

61. The bone screw of claim 43, wherein each edge is substantially sharp.

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